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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/550,609

09/23/2005

Shugo Higashi

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EXAMINER

CANTELMO, GREGG

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

12/15/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/550,609	Applicant(s) HIGASHI, SHUGO	
	Examiner Gregg Cantelmo	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) ____ is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/23/05; 8/23/06</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Response to Preliminary Amendment

1. The preliminary amendment received September 23, 2005 has been entered. Claims 1-12 are pending action on the merits.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

3. The information disclosure statements filed September 23, 2005 and August 23, 2006 have been placed in the application file and the information referred to therein has been considered as to the merits.

Specification

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: the invention of claim 4 is not clearly explained or recited in the body of the specification. Notably, there is no explicit recitation of a variance in the circulation resistance as recited in claim 4. Clarification is respectfully requested.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
5. Claims 1-4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,686,085 (Fujii) in view of U.S. Patent No. 6,596,426 (Yang).

Fujii discloses a fuel cell system comprising: a laminate of unit cells, each unit comprising a coolant passage; a coolant supply manifold 64a passing through the laminate (see Figs. 2 and 5), which distributes coolant from a coolant source (not shown) provided outside the laminate to the coolant passages the unit cells; a coolant discharge manifold 64b passing through the laminate, which recovers coolant from the coolant passages of the unit cells to the coolant recirculation device.

Fujii does not teach of the particulars of the coolant recirculation device, of a valve which shuts off circulation of the coolant between the laminate and the coolant recirculation device; and a bypass passage connecting the coolant supply manifold and the coolant discharge manifold, wherein the bypass passage has a larger cross-section than a cross-section of the coolant passages (claim 1); of the valve structure of claims 2 and 3), of a pump (claim 7),

Yang discloses of external coolant supplies which further include a valve for controlling the flow of coolant between the recirculation device and the fuel cell coolant

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passages (see Fig. 1). The system includes a valve between the main coolant system and a bypass line 132 on the opposite end of the fuel cell stack from the main coolant system components (applied to claim 1). The system further includes valves 122, 128 and 126 which can shut the connection off between any number of the coolant manifolds and the recirculation device (as applied to claims 2 and 3). As best that claim 4 can be understood, the resistance will expectedly increase along the stack in a direction increasing from the coolant recirculation system (Fig. 1 as applied to claim 4). The fuel cell system further comprises a pump 112 which recirculates the coolant in a coolant recirculation passage including the coolant supply manifold, the coolant discharge manifold, and the bypass passage (Fig. 1 as applied to claim 7).

The significance of this structure is that it improves the thermal management and the efficiency of operation of the fuel cell stack.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fujii by incorporating the coolant system of Yang since it would have improved the thermal management and efficiency of operation of the fuel cell stack.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii in view of Yang as applied to claim 7 above, and further in view of either U.S. Patent Application Publication No. 2002/0192521 (Raiser).

The difference not yet discussed is of the fuel cell system further comprising end grips wherein the bypass is disposed in the grips.

Raiser discloses a similar fuel cell stack wherein end plates 16 and 16' are disposed at the ends of the fuel cell stack and impart compression to the stack and wherein each end plate further includes a coolant passage 17 (see Fig. 2).

Yang teaches of disposing a bypass adjacent to one end of the stack of cells but does not teach of a particular compression means for the stack.

One of ordinary skill in the art would have reasonably arrived at the claimed configuration for the following reasons. First, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fujii in view of Yang by providing grips or compression plates at the opposing ends of each stack as taught by Raiser since it would have imparted the requisite compression along the stack thereby improve the contact between the various components across the stack. Improved contact provides better ionic and electronic conductivity through the particular elements in the stack. Second Raiser suggests disposing coolant means in the end plates of the stack. Thus would have further been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fujii in view of Yang by disposing the bypass line in one of the end plates since it would have integrated the compression element and bypass line of the fuel cell stack into a single integrated structure.

7. Claims 8 and 9 rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii in view of Yang as applied to claims 1, 4, 6 and 7 above, and further in view of U.S. Patent No. 5,677,063 (Kawatsu) or U.S. Patent Application Publication No. 2002/0160239 (Cutright).

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Yang does teach of using temperature sensors 142 to monitor the temperature of the stack and respond accordingly. However the control mechanism therein does not clearly recite or teach of the programmable controller programmed to control a discharge flow rate of the pump based on the temperature of the laminate.

Regarding claim 8:

The difference not yet discussed is of the system having a temperature sensor and a programmable controller programmed to control a discharge flow rate of the pump based on the temperature.

Kawatsu further teaches that it is known in the art to control a coolant pump with a programmable controller which is programmed to control the flow rate of coolant to the fuel cell in response to a sensed condition of the fuel cell system (col. 19, ll. 25-45). Cutright discloses a similar automated system wherein a programmable controller is programmed to control the coolant pump in response to temperatures of the system (Fig. 1 and para. 44).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fujii in view of Yang by further providing programmable controller programmed to control a discharge flow rate of the pump based on the temperature of the fuel cell stack as taught by Kawatsu and Cutright since it would have provided an improved responsive temperature control system for the fuel cell stack and improve the thermal management and operating efficiency of the fuel cell stack.

Regarding claim 9:

The difference not yet discussed is of the system having a temperature sensor and a programmable controller programmed to control coolant flow valves based on the temperature.

Kawatsu further teaches that it is known in the art to control coolant valves with a programmable controller which is programmed to control the flow rate of coolant to the fuel cell in response to a sensed condition of the fuel cell system (col. 7, ll. 53-64). Cutright discloses a similar automated system wherein a programmable controller is programmed to control the various elements of a fuel cell system in response to sensed conditions of the system including the temperature of the system (Fig. 1 and para. 44).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fujii in view of Yang by further providing programmable controller programmed to control coolant flow valves based on the temperature of the fuel cell stack as taught by Kawatsu or Cutright since it would have provided an improved responsive temperature control system for the fuel cell stack and improve the thermal management and operating efficiency of the fuel cell stack.

8. Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii in view of Yang and either Kawatsu or Cutright as applied to claim 9 above, and further in view of U.S. Patent No. 6,682,839 (Wilkinson) and JP 59-184467 (JP '467).

The differences not yet discussed are of the use of a temperature deviation sensor which detects a deviation in temperature of the fuel cell stack and in response to a deviation, the controller is programmed to vary a valve based on the temperature

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deviation (claim 10) or wherein the sensor comprises a plurality of sensors for the different cells (claim 11).

Wilkinson discloses a temperature control system wherein temperature sensor 45 detects a deviation of the temperature from a preset range and adjusts the flow of coolant accordingly (Fig. 5; col. 9, ll. 14-30 and paragraphs bridging columns 12 and 13). The arrangement in Fig. 5 shows a sensor 45 but as found in the para. bridging columns 12 and 13 can comprise a plurality of temperature sensors to monitor the temperature of the separator plates. It is well known in the art that a temperature deviation occurs between the middle of a fuel cell stack and the ends of the fuel cell stack. Therefore providing two temperature sensors one to the middle of the stack and one to the end provides for an obvious improved monitoring of the temperature at regions wherein deviation of the operating temperature would be greater. Thus the control of the temperature and operation of the stack can be improved in the presence of multiple temperature sensors. Such an arrangement is generically disclosed in JP '467 which uses plural sensors 6 to monitor the voltage and temperature of each cell in a stack of fuel cells (Fig. 1 and abstract as applied to claim 11).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fujii in view of Yang and either Kawatsu or Cutright by further including temperature sensors to monitor the deviation of temperature in a fuel cell as taught by Wilkinson since it would have provided an improved system for detecting and responding to variances detected in a given cell in a stack. In addition, it would have been obvious to one of ordinary skill in

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the art at the time the claimed invention was made to modify the teachings of Fujii in view of Yang and either Kawatsu or Cutright by further using at least plural temperature sensors as shown by JP '467 to detect temperatures of individual cells since it would have provided an improved temperature control and operation efficiency of the fuel cell stack.

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii in view of Yang as applied to claim 7 above, and further in view of U.S. Patent No. 5,085,949 (Sanderson) or U.S. Patent No. 7,179,554 (Ballantine).

The difference not yet discussed is of the fuel cell system further comprising a voltage sensor and a programmable controller which controls a discharge flow rate of the coolant pump.

It is known in the art to employ voltage detectors along a plurality of fuel cell in a fuel cell stack and to correlate deviations in voltage with abnormal temperature conditions (see Fig. 1 and col. 3, ll. 1-30 of Sanderson). Ballantine similarly discloses a fuel cell system which monitors the voltages of a set of fuel cells and adjusts the flow of coolant accordingly (see paras. 35-36).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Fujii in view of Yang by further providing a voltage sensor and controller as taught by either Sanderson or Ballantine since it would have provided the predictable result of improving the thermal management and operational efficiency of the fuel cell stack.

Allowable Subject Matter

Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: none of the prior art of record reasonably teach, suggest or render obvious the invention of claim 5 which further recites that the center portion of the laminate is situated lower than both ends of the laminate. It is further noted that none of the references cited in the corresponding international search report anticipate or obviate the invention of claim 5 either.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is 571-272-1283. The examiner can normally be reached on Monday to Thursday, 8:30-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Gregg Cantelmo/
Primary Examiner, Art Unit 1795